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LAWRENCE LIVERMORE LABORATORY

University of California/Livermore, California

FISSION CROSS SECTION MEASUREMENTS AT
THE LLL 100-MeV LINAC[†]

J. C. Browne

May 9, 1975

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FISSION CROSS SECTION MEASUREMENTS AT THE LLL 100-MeV LINAC

J. C. Browne

The purpose of this report is to provide information to the Chairman of the U.S. Nuclear Data Committee (USNDC) concerning the fission cross-section measurement program at the Livermore 100-MeV linac.

1. ^{235}U Fission Cross Section (J. B. Czirr, G. S. Sidhu)

The object of this experiment is to measure σ_f for ^{235}U from thermal energy to 20 MeV to an accuracy of 1%. This consists of several different measurements. First, the fission cross section is measured relative to the n,p scattering cross section in the neutron energy range from 0.8 MeV to 20 MeV. This measurement has been completed and is described in two reports, UCRL-76041 and UCRL-76676. The accuracy of the measurement is 1% from 0.8 MeV to 7 MeV and increases to 2% at 14 MeV. The second part of the experiment is the ratio of the ^{235}U fission cross section relative to the ^6Li (n, α) cross section from thermal to 1 MeV. This measurement used a 0.5 mm thick piece of ^6Li glass. Corrections for neutron scattering from oxygen were directly measured for several thicknesses of glass and hence the ratio could be extrapolated to zero thickness. These results are also complete and are described in UCRL-76572.

The third part of this experiment is to measure the absolute cross section of ^6Li (n, α) relative to a "black" detector. A new "black" detector is being designed and built by J. B. Czirr. This measurement is planned for late 1975.

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2. Fission Cross-Section Ratios (J. W. Behrens, G. W. Carlson)

A measurement of the ratio of the fission cross sections of ^{233}U and ^{238}U relative to ^{235}U has been completed in the energy range 1 keV to 30 MeV for ^{233}U and 100 keV to 30 MeV for ^{238}U . Statistical uncertainties in the data are less than 4%. The data were taken at 34 meters from the linac target which yielded an energy resolution of 5% at 20 MeV and 1.5% at 1 MeV. This measurement is described in UCRL-76219.

Final measurements are in progress to complete the ^{239}Pu to ^{235}U ratio over a similar energy range.

In addition, the ratio of the fission cross sections of ^{233}U and ^{239}Pu relative to the $^6\text{Li} (n,\alpha)$ cross section are presently being measured in the energy range from thermal to 1 MeV. These measurements along with the $^{235}\text{U}/^6\text{Li}$ measurements of Czirr discussed above will provide an accurate normalization for these cross sections.

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J. D. Anderson

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